# Claims

[c1]    1. A method for controlling fuel injection during engine startup in a hybrid electric vehicle, the hybrid electric vehicle having an engine adapted to drive a vehicle wheel and including a plurality of cylinders and a fuel injector associated with each cylinder, a power source, an electrical machine adapted to be powered by the power source to drive the engine or the vehicle wheel, and a control module for monitoring and controlling the hybrid electric vehicle, the method comprising the steps of:

driving the engine with the electrical machine;

determining whether the engine is at a target state;

selecting a cylinder for fuel injection;

calculating an amount of fuel to provide to the cylinder;

injecting the amount of fuel with the fuel injector; and

repeating the selecting, calculating, and injecting steps for another cylinder for a predetermined number of iterations.

[c2]    2. The method of claim 1 wherein the engine further comprises an air intake manifold adapted to provide air to the plurality of cylinders and the step of determining whether the engine is at the target state comprises de-

termining whether a pressure sensed in the air intake manifold is less than a first limit value.

[c3]     3. The method of claim 2 wherein the step of determining whether the engine is at the target state comprises determining whether a number of cylinder events exceeds a second limit value.

[c4]     4. The method of claim 1 wherein the step of determining whether the engine is at the target state comprises determining whether a predetermined amount of time has elapsed.

[c5]     5. The method of claim 1 wherein the step of calculating the amount of fuel to provide to the cylinder comprises obtaining a first fuel/air ratio value, calculating a second fuel/air ratio value based on an engine coolant temperature and a counted number of cylinder events, adding the first and second fuel/air ratio values to produce a target fuel/air ratio value, and determining the amount of fuel to provide based on the target fuel/air ratio value.

[c6]     6. The method of claim 5 wherein the time required to calculate the first fuel/air ratio value is greater than the time required to calculate the second fuel/air ratio value.

[c7]     7. The method of claim 5 wherein the second fuel/air ratio value calculated during a current iteration is less than

the second fuel/air ratio value calculated during a preceding iteration.

[c8]    8. The method of claim 1 wherein the amount of fuel provided to each of the plurality of cylinders is constant for a subset of the predetermined number of iterations.

[c9]    9. A method for controlling fuel injection during engine startup in a hybrid electric vehicle, the hybrid electric vehicle having an engine adapted to drive a vehicle wheel and including a plurality of cylinders, a power source, an electrical machine adapted to be powered by the power source to selectively drive the engine or the vehicle wheel, and a control module for monitoring and controlling the hybrid electric vehicle, the method comprising the steps of:

driving the engine with the electrical machine;

determining whether the engine is at a target speed;

selecting a cylinder for fuel injection;

calculating a first fuel/air ratio value and a second fuel/air ratio value indicative of an additional amount of fuel to provide to the cylinder;

providing a target fuel/air ratio to the cylinder based on the first and second fuel/air ratio values;

incrementing a counter; and

repeating the selecting, calculating, providing, and incrementing steps with the control module until the

counter exceeds a predetermined value.

[c10]   10. The method of claim 9 wherein the engine further comprises an air intake manifold adapted to provide air to the plurality of cylinders and the step of determining whether the engine is at the target speed includes determining whether air pressure in the air intake manifold is less than a first limit value.

[c11]   11. The method of claim 9 wherein the step of determining whether the engine is at the target speed comprises determining whether the counter exceeds a second limit value.

[c12]   12. The method of claim 9 wherein the step of determining whether the engine is at the target speed comprises determining whether a predetermined amount of time has elapsed.

[c13]   13. The method of claim 9 wherein the time required to calculate the first fuel/air ratio value is greater than the time required to calculate the second fuel/air ratio value.

[c14]   14. The method of claim 9 wherein the first fuel/air ratio value is greater than the second fuel/air ratio value.

[c15]   15. The method of claim 9 wherein the target fuel/air ratio decreases each iteration to reduce vehicle emissions.

[c16]   16. A method for controlling fuel injection during engine startup in a hybrid electric vehicle, the hybrid electric vehicle having an engine adapted to drive a vehicle wheel and including a plurality of cylinders, a fuel injector associated with each cylinder, an air intake manifold, a camshaft, a crankshaft, and an engine cooling system, a power source, an electrical machine adapted to be powered by the power source to drive the engine or the vehicle wheel, a first signal indicative of an air intake manifold pressure, a second signal indicative of a camshaft position, a third signal indicative of a crankshaft position, a fourth signal indicative of an engine coolant temperature, and a control module for monitoring and controlling the hybrid electric vehicle, the method comprising the steps of:

driving the engine with the electrical machine;

determining whether the engine is at a target state;

selecting a cylinder for fuel injection;

calculating a target fuel/air ratio value;

incrementing a counter value;

providing an amount of fuel to each of the plurality of cylinders in a predetermined sequence based on the target fuel/air ratio value; and

repeating the calculating, incrementing, and providing steps for a predetermined number of iterations.

[c17] 17. The method of claim 16 wherein the engine is at the target state when the first signal is less than a first limit value.

[c18] 18. The method of claim 16 wherein the step of selecting a cylinder is based on the second and third signals.

[c19] 19. The method of claim 16 wherein the step of calculating the target fuel/air ratio value further comprises obtaining a first fuel/air ratio value, calculating a second fuel/air ratio value based on the fourth signal and the counter value, and adding the first and second fuel/air ratio values.

[c20] 20. The method of claim 16 wherein the second fuel/air ratio value decreases each iteration to reduce vehicle emissions.